J. T. NEEDHAM.

ROTARY BLOWER.

APPLICATION FILED NOV. 30, 1914. RENEWED JAN. 29, 1919.

1,315,233.

Patented Sept. 9, 1919.

3 SHEETS—SHEET 1.

Fig: 1

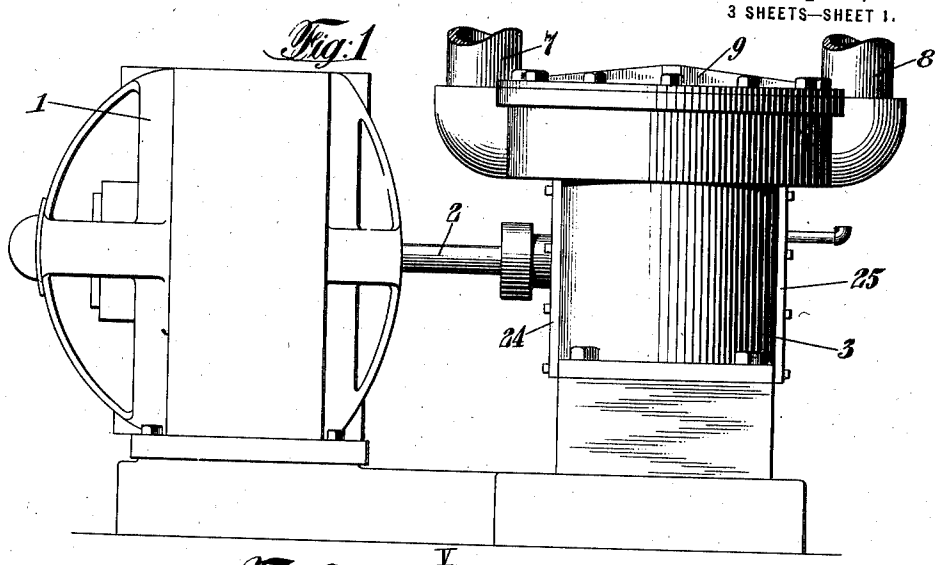
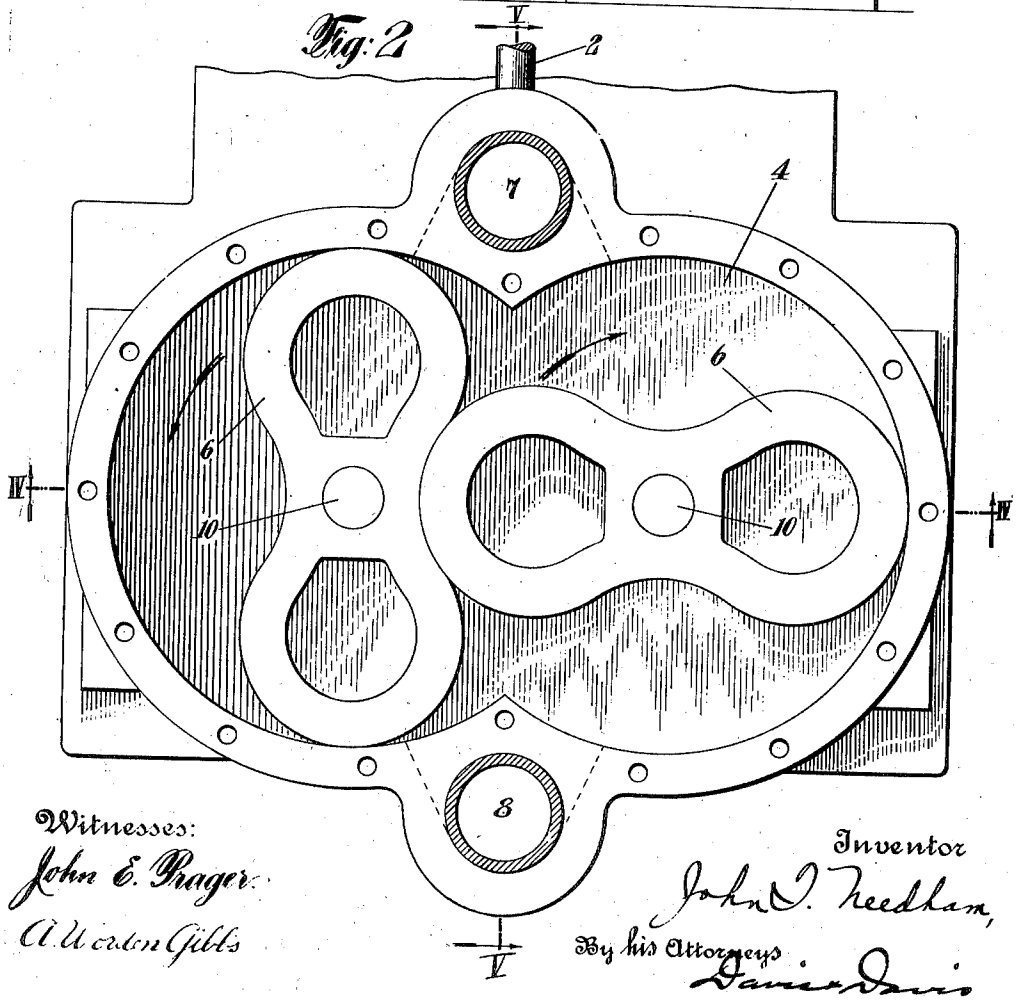


Fig: 2



Witnesses:

John E. Prager.

A. Macon Gibbs

Inventor

John T. Needham,

By his Attorneys

Daniel Davis

J. T. NEEDHAM.

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3 SHEETS—SHEET 2.

Fig. 3

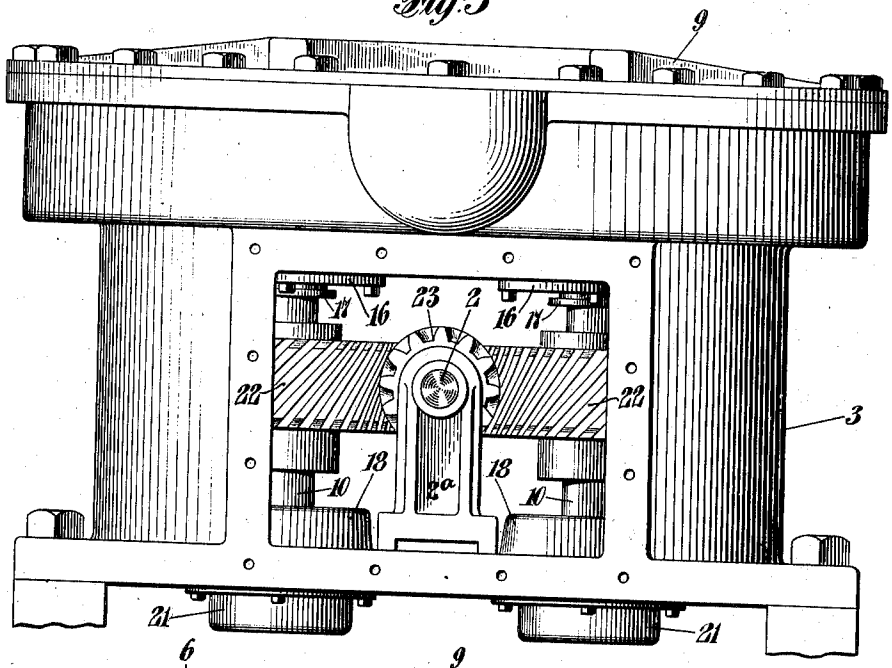
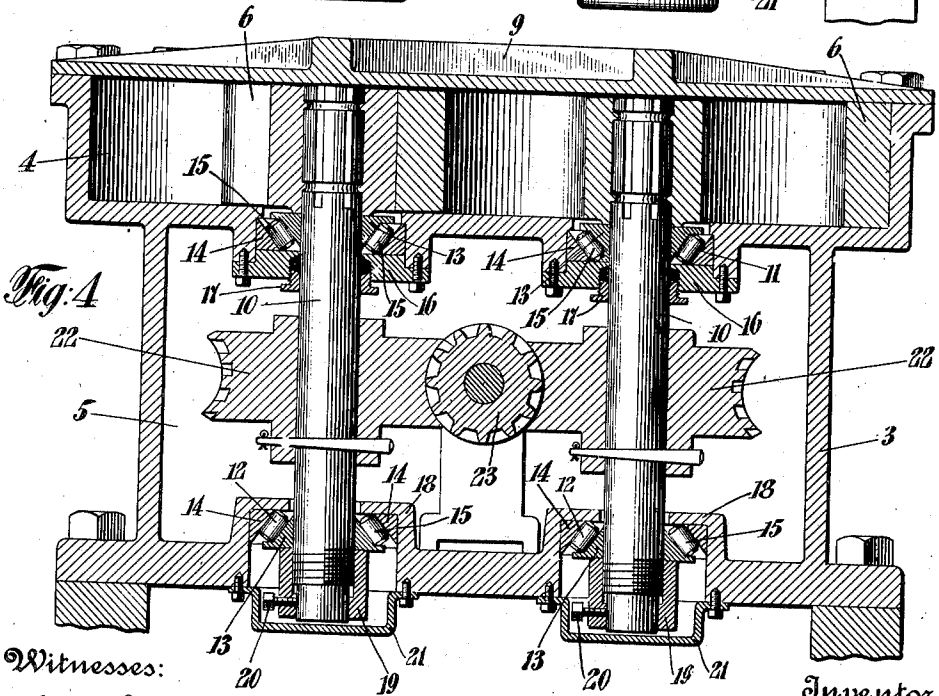


Fig. 4



Witnesses:

John E. Prager

A. Worden Gitts

Inventor

John T. Needham,

By his Attorneys.

Dawson & Dawson

J. T. NEEDHAM.

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3 SHEETS—SHEET 3.

Fig. 5

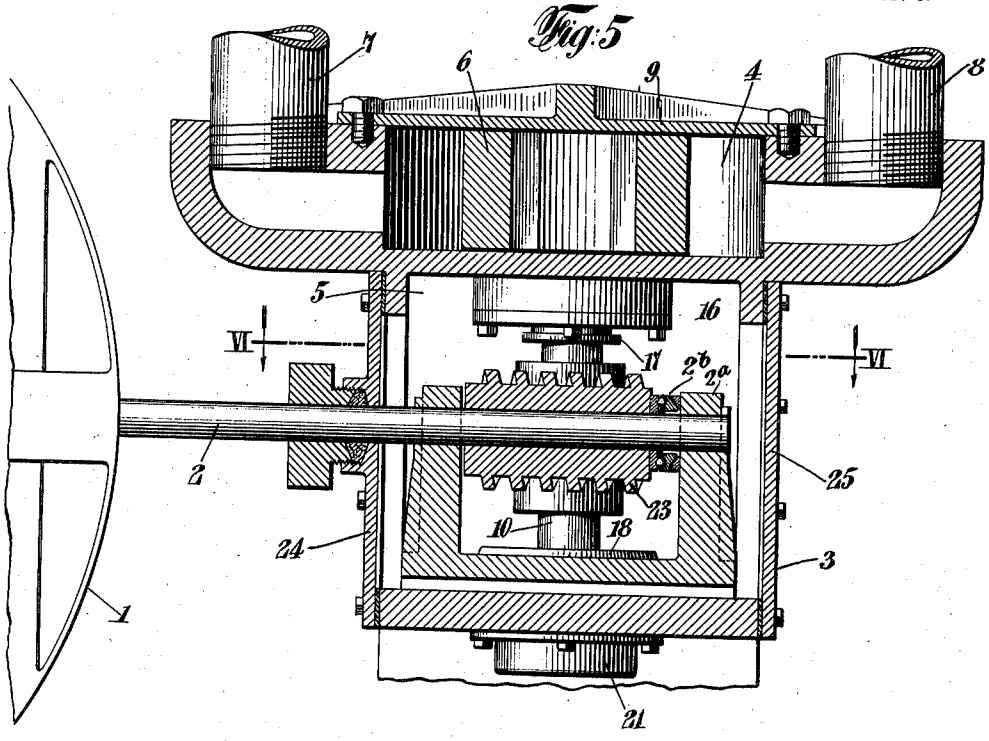
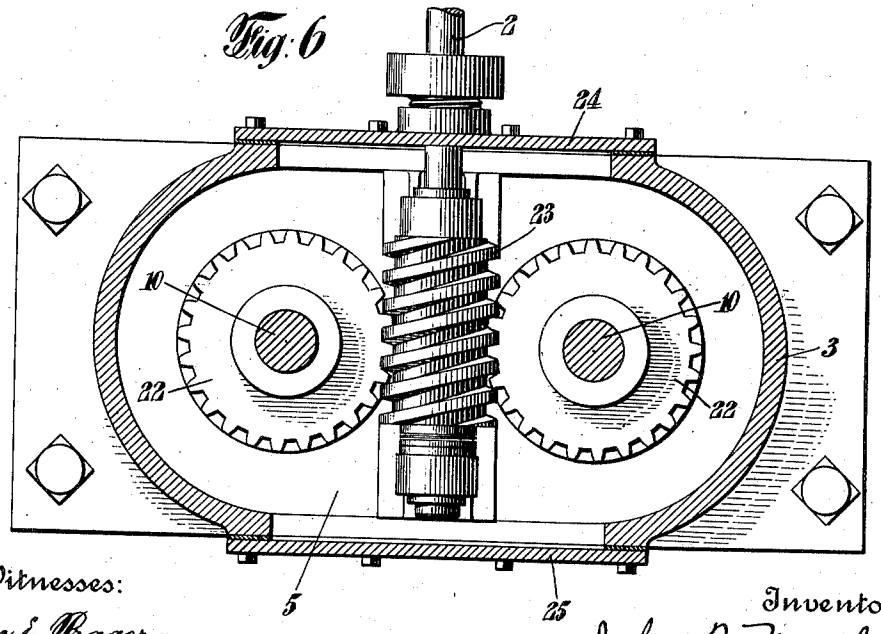


Fig. 6



Witnesses:

John E. Prager

A. Worden Gibbs

Inventor

John T. Needham,

By his Attorneys.

Dawson & Dawson

UNITED STATES PATENT OFFICE.

JOHN T. NEEDHAM, OF BAYONNE, NEW JERSEY.

ROTARY BLOWER.

1,315,233. Specification of Letters Patent. Patented Sept. 9, 1919.

Application filed November 30, 1914, Serial No. 874,637. Renewed January 29, 1919. Serial No. 273,885.

To all whom it may concern:

Be it known that I, JOHN T. NEEDHAM, a subject of the King of Great Britain, a citizen of Canada, and resident of Bayonne, county of Hudson, and State of New Jersey, have invented certain new and useful Improvements in Rotary Blowers, of which the following is a specification.

This invention relates to that class of rotary blowers in which two intermeshing rotors are employed within a suitable inclosing casing, said rotors impelling the air through the discharge port at one side of the casing and drawing it through the inlet at the other side of the casing. The shape and operation of these rotors are well known and need not be particularly described herein. The present invention relates more particularly to the arrangement of the rotors and to the construction and arrangement of the parts of the blower as a whole.

One of the main objects of the invention is to provide a driving mechanism for the rotors so disposed that the strain will be equally distributed and simultaneously applied directly to the shafts of the rotors from the motor or driving shaft, said driving mechanism being of such a character that it will serve as a speed reducing means. The great advantage of such a construction lies in the fact that the armature shaft of an electric motor may be directly geared to the rotor shafts, intermediate speed reducing gears being dispensed with.

Another object of the invention is to mount the rotors on the ends of the rotor shafts, the bearings for said shafts being arranged on one side of the rotors. By this arrangement the rotors may be placed in a compression chamber provided with an imperforated cover plate which may be removed without in any way disturbing or disarranging the rotors or impellers, or the operating mechanism therefor. This is of advantage not only in assembling the parts of the blower but whenever it may be desired to inspect the rotors and to observe their co-action in operation.

Another object of the invention is to mount the rotors on the upper ends of their shafts and to arrange them in a compression chamber having an imperforate top plate or cover, the shafts being mounted in self-centering anti-friction bearings and the driving power being applied directly and simultaneously to said shafts and between the said anti-friction bearings. The great advantage of this construction is that the rotors or impellers may be fitted very close together thereby increasing the efficiency of the blower. In the ordinary blowers of this type the shafts are horizontally arranged with the result that the impellers cannot be closely fitted together for the reason that a reasonable amount of play must be permitted to allow for the wearing on the shafts and bearings. It is obvious that the greater the play or space between the impellers the greater the loss or efficiency in the compression chamber. The great advantage of applying the power directly to the impeller shafts between the bearings is that the wearing will be uniform on the bearings and will not affect the close relation and engagement of the rotors or impellers.

Another object of the invention is to so arrange the rotors or impellers that they may be inclosed in a compression chamber having an imperforate cover or top plate and to arrange the driving mechanism so that it may be inclosed in an oil tight chamber. The object of this is that the driving mechanism may be immersed in oil and the rotors or impellers placed in an independent compression chamber in a position to be readily inspected while rotating, by merely removing the cover plate and without disturbing any of the mechanism.

There are other advantages of the invention due to the particular construction and arrangement of parts, all of which will be fully hereinafter described.

In the drawings Figure 1 is a side elevation of the blower showing an electric motor directly coupled thereto;

Fig. 2 a plan view showing the rotors or impellers in the compression chamber, the top or cover plate being removed;

Fig. 3 a front elevation of the blower the front plate closing the oil chamber being removed;

Fig. 4 a vertical transverse sectional view of the blower on the line IV—IV of Fig 2;

Fig. 5 a vertical sectional view of the blower on the line V—V of Fig. 2; and

Fig. 6 a horizontal sectional view on the line VI—VI of Fig. 5.

Referring to the various parts by numerals, 1 designates an electric motor for driving the blower. Said motor may be of any suitable construction and its motor shaft is directly connected to the driving shaft 2 of the blower.

The blower consists of a casing and support 3, said casing being formed with a compression chamber 4 at its upper end and with an oil chamber 5 directly below the compression chamber. In the compression chamber are arranged the two rotors or impellers 6 which are adapted to be rotated in opposite directions as indicated by arrows in Fig. 2, the air being drawn in through passage 7 and forced out through passage 8 in the usual manner of air compressors or blowers using impellers or rotors of this type. The compression chamber is closed by an imperforate top plate or cover 9. Whenever desired this plate may be removed without disturbing the rotors or any of the blower mechanism and when it is removed the impellers may be rotated in the usual manner so that their mutual co-action may be closely observed.

The rotors are mounted on the upper ends of vertical shafts 10 which extend through the bottom of the compression chamber and through the oil chamber 5, as clearly shown in Fig. 4 of the drawings. Each shaft 10 is mounted in self-centering anti-friction roller bearings, one of said bearings 11 being arranged in the bottom of the compression chamber and the other bearing 12 being arranged in the bottom of the oil chamber. Each bearing consists of the centering cone 13, the ring or cup 14 and the rollers 15 or other anti-friction devices interposed between the cup and the cone. The cones are fitted tightly on the shafts, the upper cone 13 being inverted, its upper surface contacting with the lower surface of the rotor. The cup or ring 14 of the upper bearing is held in place by means of a retaining plate 16 and said plate carries a stuffing box and gland 17 which prevents oil creeping up the shaft through the bearing and into the compression chamber. The upper bearings are so adjusted that the rotor or impeller is just free of the bottom of the compression chamber; and the impeller is of such a thickness or height that it fits close to, but is just free of, the inner surface of the cover plate. In the lower bearing of each shaft the ring 14 is mounted in an inverted cup 18 formed on the bottom of the oil chamber and extending up into said chamber. The cone of this lower bearing is held in place by means of a vertically adjustable nut 19 screwed on the lower end of the shaft, said nut being held in its adjusted position by means of a screw 20. The lower end of cup 18 is closed by a cap 21 which is screwed on the bottom of the casing and incloses the end of the shaft. It will be seen that the rotor and the shaft are practically suspended on the upper roller bearing, and that as said bearing is self-centering, wear thereon will not disturb the relative arrangement and positions of the two rotors, the axis of said rotors remaining in a fixed relative position with respect to each other.

On each rotor shaft within the oil chamber 5 and between the bearings 11 and 12 is secured a worm gear 22. Between the two rotor shafts is arranged the horizontal driving shaft 2 on which is mounted a worm 23, said worm engaging the worm gears on the rotor shafts and driving one of said gears in one direction and the other in the opposite direction. The worm directly and simultaneously drives the rotor shafts in opposite directions with the same speed, each worm gear receiving directly the strain or power sufficient to drive the connected impeller or rotor. By rotating each rotor shaft directly from the driving shaft each of said shafts takes up only the strain necessary to rotate the impeller connected thereto. This results in an even distribution of the driving strain and avoids the danger of the impellers being thrown out of their proper relation to each other due to uneven strains and wear on shafts. In the ordinary blowers of this type power is usually applied to one of the impeller shafts and is transferred through gearing to the other shaft. This results in uneven strains and with the consequent uneven wearing of the shafts and bearings. It is obvious that this uneven wear results in a change in the relation of the impellers, and in a loss of efficiency in the compression chamber. In the oil chamber is arranged a driving-shaft-supporting frame 2^a provided with suitable bearings for the driving shaft, which are independent of the casing of the blower. The inner end of this supporting frame is provided with a bearing 2^b designed to take up the end thrust of the driving worm.

The worm and worm gears arranged as described herein and as shown in the drawings, serve as speed reducing means, thereby dispensing with the speed reducing gears used in the ordinary blowers of this type.

The oil chamber is preferably closed by front and back plates 24 and 25, shown clearly in Fig. 5. When these plates are in position the oil chamber may be filled with oil to the desired point so that the driving gears and the lower bearings run in oil. The stuffing boxes and glands 17 prevent the oil creeping up the rotor shafts to the upper roller bearings and into the compression chamber.

While I have shown the compression chamber comparatively shallow and the

operating faces of the rotors correspondingly narrow, it will, of course, be understood that the compression chamber may be of any suitable depth and the rotors of a width to fit said compression chambers.

What I claim is:

1. A blower comprising a casing formed with an upper compression chamber and a lower oil chamber, a pair of parallel rotor shafts extending through the oil chamber, rotors on the upper ends of said shafts in the compression chamber, self-centering bearings for said shafts, one of said bearings sustaining the weight of the shaft and the connected rotor, a worm gear connected to each of said shafts in the oil chamber, and a driving worm arranged between and directly engaging both of said worm gears.

2. A blower comprising a casing formed with a compression chamber and an oil chamber, a pair of rotor shafts extending vertically through the oil chamber, a rotor on each of said shafts and within the compression chamber, self-centering bearings for said shafts, one of said bearings serving as a suspending means for the shaft and sustaining the weight thereof and the attached rotor, a worm gear connected to each of said shafts, and a driving worm arranged between and directly engaging both of said worm gears.

3. A blower comprising a frame formed with a compression chamber and an oil chamber, two vertical shafts extending through said oil chamber, rotors on the upper ends of said shafts in the compression chamber, self-centering anti-friction bearings for said rotor shafts in the upper and lower walls of the oil chamber, the upper bearing serving as a suspending means for the shaft and the rotor, a worm gear connected to each rotor shaft in the oil chamber and between the said bearings, a driving worm between said worm gears and directly engaging the same and an imperforate removable cover plate closing the upper end of the compression chamber.

4. A blower comprising a casing formed with an upper compression chamber and a lower oil chamber directly under the compression chamber and separated therefrom by a horizontal wall, a pair of rotor shafts extending vertically through said oil chamber and into the compression chamber, rotors on the upper ends of said shafts in the compression chamber, a worm gear connected to each of said rotor shafts in the oil chamber, and a single driving worm arranged between the rotor shafts with its axis perpendicular to the axes of the rotor shafts, said driving worm directly engaging the worm gears and driving the rotor shafts in opposite directions.

5. A blower comprising a casing formed with an upper compression chamber and a lower oil chamber directly under the compression chamber and separated therefrom by a horizontal wall, a pair of rotor shafts extending vertically through said oil chamber and into the compression chamber, rotors on the upper ends of said shafts in the compression chamber, a worm gear connected to each of said rotor shafts in the oil chamber, a single driving worm arranged between the rotor shafts with its axis perpendicular to the axes of the rotor shafts, said driving worm directly engaging the worm gears and driving the rotor shafts in opposite directions, and antifriction bearings for each rotor shaft in the upper and lower walls of the oil chamber, said bearings centering and sustaining the said shafts and the rotors carried thereby.

6. A blower comprising a casing formed with an upper compression chamber and a lower oil chamber directly under the compression chamber and separated therefrom by a horizontal wall, a pair of rotor shafts extending vertically through said oil chamber and into the compression chamber, rotors on the upper ends of said shafts in the compression chamber, a worm gear connected to each of said rotor shafts in the oil chamber, a horizontal driving shaft extending into the oil chamber between the rotor shafts and perpendicular to the axes of said shafts, a single driving worm carried by said shaft between the worm gears on the rotor shafts and directly engaging the same to drive them in opposite directions, a bearing frame within the oil chamber to support the driving shaft, and means carried by said frame at the inner end thereof to take up the end thrust of the driving worm.

7. A blower comprising a casing formed with a compression chamber and an oil chamber separated from the compression chamber by a wall, a pair of parallel rotor shafts extending through the oil chamber and into the compression chamber, rotors on the ends of said shafts within the compression chamber, a worm gear connected to each of said rotor shafts in the oil chamber, and a single driving worm arranged between the rotor shafts with its axis perpendicular to the axes of the rotor shafts, said driving worm directly engaging the worm gears and driving the rotor shafts in opposite directions.

8. A blower comprising a casing formed with a compression chamber and an oil chamber separated from the compression chamber by a wall, a pair of parallel rotor shafts extending through the oil chamber and into the compression chamber, rotors on the ends of said shafts within the compression chamber, a worm gear connected to each of said rotor shafts in the oil chamber, a driving shaft extending into the oil cham-

ber between the rotor shafts and perpendicular to the axes of said shafts, a single driving worm carried by said shaft between the worm gears on the rotor shafts and directly engaging the same to drive them in opposite directions, a bearing frame within the oil chamber to support the driving shaft, and means carried by said frame at the inner end thereof to take up the end thrust of the driving worm.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

JOHN T. NEEDHAM.

Witnesses:
F. R. MILLER,
MINERVA VAN ALEN.